DOCUMENT RESUME

ED 220 815 CS 006 804

AUTHOR Henk, William A.
TITLE Neurological Impress and Reading: How and Why?
PUB DATE Oct 81
NOTE 38p.; Paper presented at the Annual Meeting of the Three Rivers Reading Conference (13th, Pittsburgh, PA, October 1981).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Processes; Elementary Education; Intervention; Learning Theories; *Oral Reading; Reading Difficulties; Reading Improvement; *Reading Instruction; Reading Research; *Remedial Reading; Teacher Effectiveness; Teacher Role
IDENTIFIERS Direct Instruction; *Neurological Impress Method

ABSTRACT

Noting that the Neurological Impress Method (NIM) of reading instruction has been shown to be an effective intervention strategy for use with remedial readers, this paper examines the theoretical and empirical validity of NIM techniques. The discussion focuses on (1) a procedural description of the technique, which involves having student and teacher read aloud simultaneously and at a rapid rate; (2) its historical roots; (3) the relationship of NIM to constructs of observational learning and modelling; (4) its affective dimensions; and (5) its relationship to contemporary perceptual, psycholinguistic, information processing, and integrated models of reading. The paper suggests that the NIM is highly consistent with a number of generally accepted principles of verbal learning and as such is a justifiable instructional intervention for a substantial proportion of children who are experiencing reading disabilities. (Author/FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED220815

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Neurological Impress and Reading: How and Why?

Paper Presented at

The Thirteenth Annual

Three Rivers Reading Conference

The University of Pittsburgh

Pittsburgh, Pennsylvania

October 16, 1981

William A. Henk

The University of Georgia

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

William A. Henk

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CS006804

Neurological Impress and Reading: How and Why?

In recent years the Neurological Impress Method has been shown to be an effective intervention strategy for enhancing the reading abilities of students performing below their expected grade level. Children once believed to be chronic reading underachievers have, in many cases, shown rather astounding improvement. For the most part, the research has reflected this positive trend (Cook, Nolan, and Zanotti, 1980; Gardner, 1965; Heckelman, 1966, 1969; Langford, Slade, and Barnett, 1974; Miller, 1969), while in other instances the results have been mixed (Arnold, 1972; Gibbs & Proctor, 1977; Hollingsworth, 1970; Lorenz & Vockell, 1979). In those studies in which the NIM did not produce significantly better results than other techniques, it still managed to generate considerable degrees of academic and attitudinal improvement. It is the intent of this paper to familiarize participants with the practical and theoretical considerations which are involved in implementing this method of simultaneous oral reading.

The significance of Neurological Impress is related to the degree to which it departs from traditional corrective reading philosophies and procedures. Generally, when students perform below their expected capacities, they are referred to specialists for additional work in reading. More often than not, this supplemental aid consists of an intensified synthetic approach to word attack. Here the emphasis is

placed on mastering grapheme-phoneme correspondences. This direct teaching is intended to provide the student with a comprehensive arsenal of rules, generalizations, and word family knowledge for use in recoding written language. While some children profit immensely from this conventional type of remediation, others experience a further compounding of the initial difficulty. These latter students become increasingly overanalytical and, as a result, their reading fluency becomes even more disrupted. In this sense, word-by-word reading is the outcome of emphasizing a disproportionate amount of attention to be delegated to the surface levels of language. Students can become "phonic bound", that is, they see the graphic symbols as ends in themselves, rather than as a means to understanding the intended message. Consequently, they do not avail themselves of the more productive and meaningful cueing systems of syntax and semantics. The Neurological Impress Method circumvents these tendencies by encouraging students to interact with the processing strategies of efficient readers within a pressure-free, natural language context. This instructional involvement, in keeping with the theme of this conference, is believed to both "maximize learning and minimize stress."

How Does It Work?

Neurological Impress is a system of unison reading in which the student and the teacher read aloud, simultaneously, at a rapid rate. Its

purpose is to reinforce the match between audition and vision in the reading process. The procedure is defined as follows:

1. The student is positioned slightly in front of the teacher. The book is held by both.

2. Then the teacher and the child read aloud in unison. The voice of the teacher is directed toward the ear of the student.

3. Initially, the teacher slides his/her finger along the line following the words that are to be spoken. The finger-guide must be at the precise location of the spoken word.

4. The unison reading should be as fluent as possible. Pauses are allowed only as the text dictates. Never pause for mistakes. Any word that the child does not know is immediately pronounced by the teacher thus leaving no time to struggle with the pronunciation. Keep a constant forward-moving tempo. The pace of normal reading flows on unimpeded. The reading should become similar to the adult model in rate, pauses, and intonation. The only time a pause not cued by the text is acceptable is when the child's voice tires.

5. The teacher should cover as many pages as possible without causing undue discomfort to the child.

6. At no time does the teacher attempt to teach the sounds of the words or any form of word recognition. No attention is called to accompany pictures or story context. After the unison reading is completed, the teacher does not ask questions about the material. The student is not discouraged from volunteering comments on the story. The teacher should comment on the child's success and newly acquired fluidity in reading.

7. Eventually, as improvement is noted, the child is permitted to use his/her finger to point. Finger sliding by the teacher may have to be maintained throughout for some students.

8. The ultimate aim of this process is to condition the student to take over the vocal lead from the teacher. This is done subtly and by minute degrees. Through the sessions the teacher gradually lessens the amplitude of his/her voice and the student's becomes more

prominent. At any point that the student's voice falters, the teacher increases his/her voice volume accordingly. Initially, the level of reading material during the first week is somewhat lower than the student's ability level. Thereafter, it should increase in complexity up to and above the child's chronological grade placement.

9. Sessions should range between 10 to 15 minutes a day, three to five days per week. (Heckelman 1966b)

Why Does It Work?

How is it that such a simple and straightforward approach to reading improvement has proven so successful? The answer to this question is not readily apparent. Althought the method appears relatively lacking in sophistication, its credibility is rooted in sound theoretical assumptions and documented research findings. What appears on the surface to be technologically naive, is in actuality, a highly appropriate and practical strategy for helping a substantial proportion of children experiencing reading difficulties.

To the author's knowledge, no analysis has fully addressed the theoretical rationale underlying the NIM. For this reason the remainder of this paper will be devoted to an examination of current psychological and linguistic perspectives for clues to its instructional feasibility. Specifically, various sections will:

1. examine the NIM in a historical sense
2. relate the NIM to observational learning and modelling constructs
3. consider the affective dimensions of the method

4. analyze the NIM in terms of contemporary perceptual, psycholinguistic, and information processing models of reading.

Though speculative in nature, the discussion is designed to add to the practitioner's understanding of the NIM as a viable alternative and supplemental reading approach.

Historical Perspective

In 1962 R. G. Heckelman, a clinical psychologist, coined the term "neurological impress" to refer to the procedure outlined in the previous section. Heckelman was not the originator of the method but rather borrowed a technique of direct language feedback which had proven successful when used with stutterers. It was found that when the voice of the client was redirected back to the ear, the stammering stopped (Cherry and Sayers, 1956). Heckelman hypothesized that this "process of feedback could be imitated in a reading situation and that it might affect a neurological change." He suggested that the NIM is part of an audio-neural conditioning process which suppresses inefficient reading strategies and replaces them with more productive ones.

Heckelman employed the technique with an adolescent girl he was seeing as part of his private psychological practice. This girl was a severely disabled reader. She exemplified the type of reader that Heckelman referred to as "phonics bound." Despite normal intelligence, her reading ability was severely deficient. Although she should have

been reading at the ninth grade level, her performance more closely approximated third grade. Her oral reading was choppy, discontinuous, laboriously slow, and quite unlike fluent language. She attempted to attack each word individually. After twelve hours of unison reading, she had improved three full years. He proceeded to use the technique with all of his remedial clients. Each made similar improvements. Inspired by these results, Heckelman and a team of associates began a series of research projects to determine the effectiveness of the NIM on a large scale basis. In each instance the results were outstanding. Since that time several researchers have investigated the NIM (Bringman, 1979; Gawarkiewicz, 1972; and Hollingsworth, 1970, 1978).

The roots of the method go back much farther in time than Heckelman's original undertaking. Spache (1976) has suggested that a form of simultaneous oral reading much like the NIM was used in the Dame Schools of England and early colonial America. Still, the basic method may extend even more so into the past. Moffett and Wagner (1973) have likened the method to "lap reading." Here the child is propped up in mother's lap and listens and watches carefully as the stories unfold. This custom probably dates back hundreds and possibly thousands of years. This very natural means for acquiring beginning reading skills has been discussed by other authors as well (Goodman, 1967; Huey, 1968; Chomsky, 1978; Cooper and Petroskey, 1976; Forester, 1977; and Smith, 1973, 1978). Each suggests that through observation the child can infer

a tremendous amount of information concerning the functions and features of written language. This line of thought is consistent with the implicit perceptual learning theory espoused by Gibson and Levin (1978). Moffett and Wagner describe the process as follows:

> What happens when a person follows a text while hearing it read is that he matches off speech with print very grossly at first and then more and more finely. Once a few words can be recognized roughly, they serve as bench marks to keep the child synchronized. Then the process snowballs very fast; the more words he can cue from, the more specifically the young reader can synchronize the other words and begin to crack the whole code. So even with no sound-letter instruction at all a person could learn to read and spell entirely from the lap method, but only, in most cases, after many, many hours of hearing and seeing the same or similar words recur. We know this must happen because children have learned by this and nothing else.
>
> The very lack of self-consciousness and of instructional situation that has caused this method to be omitted from the official repertory of reading methods accounts partly for its great success. The learner becomes rapt and self-forgetful and relaxed. Within this deep absorption, the mind unconsciously works over the data and begins to infer the sound-spellings and "rules." Don't be fooled by the apparent easiness; children do most of their deepest learning in just this undeliberate way.[1]

The implication of this historical look at the NIM is threefold. First of all, the method is not new. In its most rudimentary form, the NIM is a time-proven technique. Secondly, it is a very natural procedure of instruction. It evolved in a very unpretentious manner because it is compatible with the human language processing system. Its methodology approximates the instinctive uncertainty-reducing model usually associated with oral language acquisition. Thirdly, this bit

[1]This account has been modified slightly to bring major points more clearly into focus.

of hindsight should indicate to the reader that the rather remarkable claims of the NIM's proponents may not be without merit.

Rather than treat the child with word recognition difficulties in such a way that he/she is made more acutely conscious of surface level forms, the NIM offers an alternative. It enables the child to direct his attention, either deliberately or subliminally, to deeper syntactical and semantic levels. It is the intervention of this structural processing that ultimately frees a reader from "phonic boundness."

Modelling and Observational Learning

Reading is an extremely complex process. For both the beginner and the remedial reader the task is especially overwhelming. From an arbitrary set of abstract graphic symbols, the reader must learn to select the most productive and economical cues available. Then he must synthesize these information-bearing units to extract meaning. All of this depends on knowing what to look for.

According to Smith (1978), this type of perceptual learning cannot be explicitly taught. He suggests that the distinctive features of letters, words, syntax, and semantic category inclusion defy verbal explanation. How can the child be shown how to attend to the most important parts of the text? Or how to use his already-developed, but latent knowledge of the syntactical system inherent in language? Or to categorically arrange information in such a way that it can be easily accessed and retrieved for immediate usage? These outcomes must be

attained implicitly through practice in "exploring and testing hypotheses in a world of meaningful print."

The NIM attempts to promote perceptual awareness through observational learning within a natural language context. Here the emphasis is on having someone perform the reading task so that the learner can infer how it is done. This would seem far less artificial than a totally behavioral orientation to initial learning. It gives the learner more credit for adaptive reasoning. Gibson and Levin (1978) state that "observational learning, if it takes place, is perceptual learning." The reading process, though admittedly complex, should still be amenable to observational learning and modelling paradigms.

Albert Bandura is the foremost adherent of observational learning theory. His research has indicated that complex patterns of behavior are more easily transmitted by providing exemplary models. Both animals and humans have been shown to respond predictably and favorably to a wide array of modelled behaviors. These studies have ranged from basic learning outcomes to socialization, self-reward, aggression, and eye-movement patterning (Bandura, 1965). Through generalizing to reading, his findings hold direct relevance for the use of the NIM as an instructional technique.

Bandura suggests that the behavior of models can be used to accelerate the acquisition process. Although he is not specifically referring to reading, he does believe that complex behavioral repertoires can be indirectly conveyed to a learner in the presence of an appropriate model.

Certainly such a position is supportive of the rationale underlying the NIM. Bandura feels that:

> "Once an individual is under the control of the discriminative stimuli of other people's behavior, these stimuli may be used to alter his future behavior."

In the case of the NIM, the model's language processing strategies may be tacitly transferred to the learner. This reasoning is in line with the previous discussion of lap reading. Notice how the NIM would promote the same type of hypothesis-test procedure as is a characteristic of language learning in general. The distinct advantage of the NIM is that it supplies immediate auditory feedback regarding the acceptability of the prediction in the presence of the corresponding visual stimuli.

Regarding this integration of perceptual information from these two modes, Bandura states:

> "When an observer witnesses a model exhibit a sequence of responses, the observer acquires, through the contiguous association of sensory events, symbolic or representational responses possessing cue properties that are capable of eliciting, at some time after a demonstration, overt responses corresponding to those that had been modelled."

How specifically do Bandura's generalizations relate to the NIM? As the child and the model read together in unison, a sophisticated form of perceptual integration is taking place. Visually the child follows the graphic symbols as the auditory counterparts are supplied directly to the ear by the model. This bimodal stimuli aspect has been physiologically demonstrated by Lassen, Ingvar, Skinhøj (1978) in studies which traced specific area of cerebral activation through observation

of blood flow patterns. To a lesser degree, intersensory integration has been shown to relate to efficient information processing by several authors (Beery, 1967; Birch & Belmont, 1964, 1965; Farnhan-Diggory & Gregg, 1975; Hartman, 1961; Kahn & Birch, 1968; Muehl & Kremenak, 1966; Sterritt & Rudnick, 1966). These latter findings must be interpreted with caution, however, because modal tasks are susceptible to contamination and because other unknown factors such as general intelligence may be responsible for a large proportion of the relationship.

Taking the integration one step farther, the NIM encourages the child to involve the articulatory apparatus as well. Though admittedly crude, this represents a tactile-kinesthetic component. In this sense, the method must be considered multisensory. By necessity, this entails that various sections of the brain, primarily the occipital (visual) and temporal (auditory) as well as the language regions (Wernicke's and Broca's areas) and the complext network of connections (angular gyrus, arcuate fasciculus, and corpus callosum), work together in a coordinated manner.

The processing strategies of the model are, according to the theory, impressed upon the brain. This is conducted at the pace of fluent reading. For the "phonics bound" child, this may be the first time that any reading-related endeavor has resulted in a product which actually resembles natural language. The learner is then free to relate to the text at deeper levels of understanding. Even so not all learners have

been responsive to the NIM. Bandura would suggest that:

> "There is no guarantee that the learner will attend to the whole range of cues, that he will select the most relevant stimuli or accurately perceive the cues to which his attention is directed. The learner's motivation and present level of functioning will determine the extent to which the behavior can be modelled."

Still most children exposed to the NIM do experience both physiological and psychological benefits. Even the eye movements of the learner may be subject to improvement. Bandura has demonstrated that the fixation quality and duration of a model can affect that of an observer when pictures are examined. By using the NIM, we would expect more economical fixations, longer saccades, and less regressions. The brain is a marvelous piece of engineering, certainly capable of unconsciously assimilating the efficient perceptual-motor patterns of a model.

Psychologically the benefits are twofold. First, the observer sees firsthand how a mature reader attends to graphophonic, syntactic and semantic information. In this way, the observer interacts with higher-order perceptual units. This results in increased organization and implementation of non-visual information. After sustained exposure to the NIM, it is assumed that a sufficient quantity of language has been sampled that general reading ability will be facilitated. Secondly, the NIM may have affective utility. By helping the child deal more effectively with reading tasks, the anxiety which formerly accompanied the act may be significantly reduced. Using this rationale it is conceivable that the

NIM could modify the child's attitude toward reading. This, in turn, could help account for the rapid gains evidenced by the method.

Affective Dimensions/Minimizing Stress

In any reading-related enterprise, the affective domain must be given consideration. All too frequently it is dismissed as "abstract or difficult to measure." This is a grave error. While the affective factors may be resistant to quantification, the child's attitude may very well be the single most important determinant of reading success. Generally it is felt that the NIM has a motivating effect on reading attitude.

Mathewson (1976) has proposed an acceptance model of the reading process. If valid, this model holds direct implications for the effectiveness of the NIM. Basically he contends that attitude determines both attention and comprehension, two elements which are critical to reading. The model attempts to predict the degree of attention and comprehension during any instant of the reading process. A simplified model appears below:

Insert Figure 1 about here

From the illustration, it is clear that an interrelationship exists between attitude, motivation, attention, comprehension and acceptance. With the NIM, it is assumed that the child's newly successful interactions with language and reading in combination with the praise he receives at the

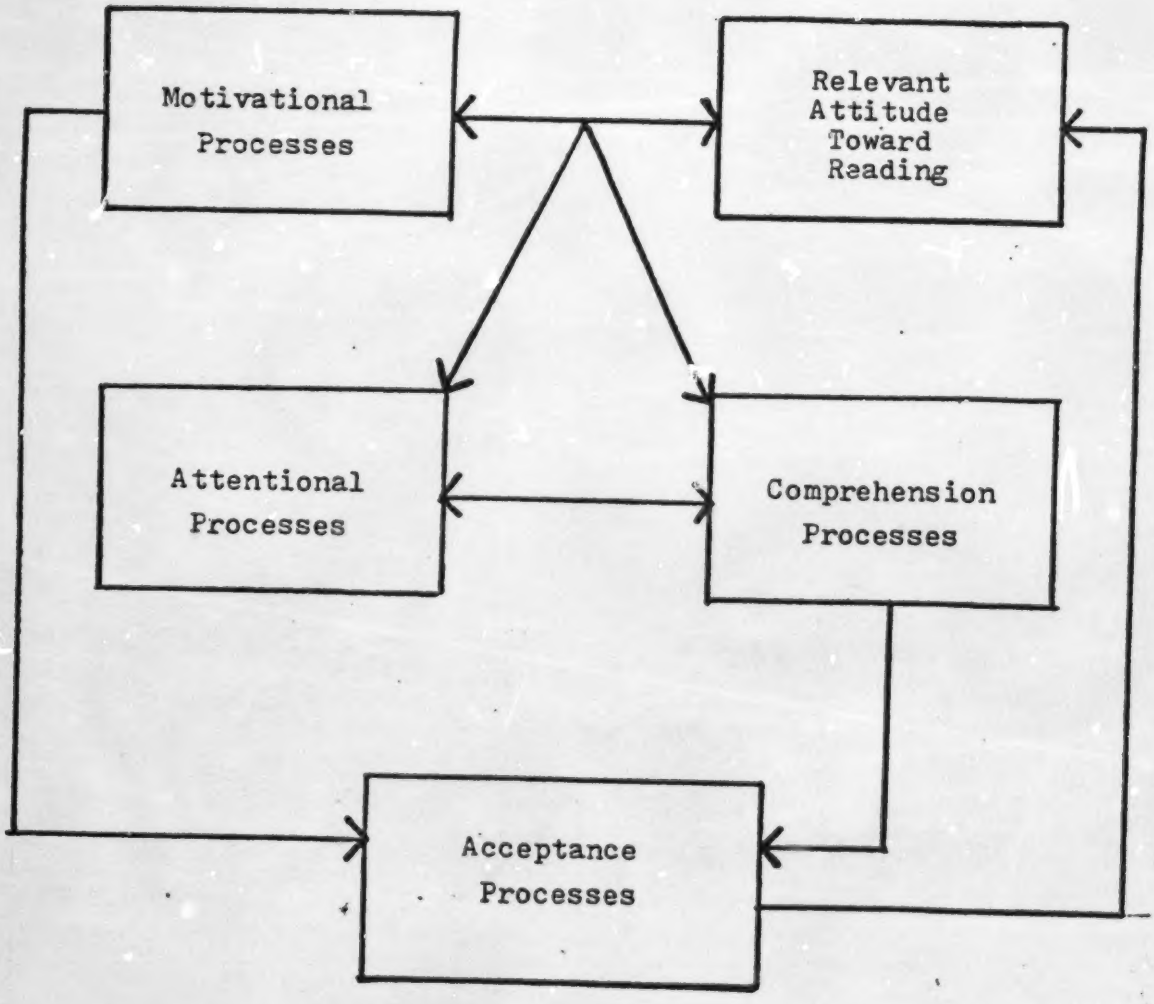


Figure 1. Mathewson's (1976) Acceptance Model.

end of each session cause an attitudinal change. Basically the child's achievement and curiosity motives are increased. This, in turn, promotes improved attention and comprehension. Within this framework, each aspect of the model is enhanced. The rewards are cyclical; that is, each tends to positively affect the others. The model predicts that as acceptance accrues so does the attitude at each instant of the reading process, the child's general motivation toward reading, attention, and understanding. It is difficult to determine where exactly the NIM has its initial impact. It should suffice to know that it positively accesses the affective vectors. The whole chain of events could snowball and, to a great extent, be influential in substantiating the phenomenal growth reported by NIM advocates.

Relationship to Perceptual, Psycholinguistic, and Information Processing Models of the Reading Process

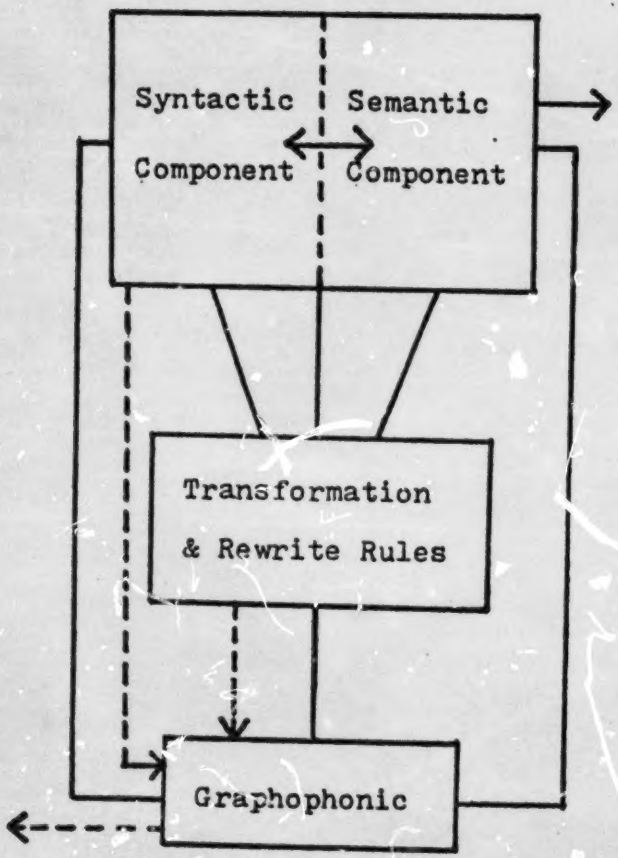
Before any method can be scrutinized for instructional validity, a reasonable understanding of the reading process itself seems warranted. Currently cognitive psychology is torn between psycholinguistic and information processing models. The psycholinguistic model explains reading as a top-down process. Information processing models assume that reading skill develops in a bottom-up fashion. Which is correct? The answer to this question is beyond the scope of this paper. Rather than assume that either position is totally justifiable, I have elected to explain the NIM in terms of those elements that they share. What follows

is a brief description of each of these two types of models and a position which synthesizes them into a more manageable framework.

The psycholinguistic model uses language as its core concept. Psycholinguists believe that language exists on three primary levels: graphophonic, syntactic, and semantic. The graphophonic level is usually referred to as the surface structure and it involves the correspondences between graphemes and phonemes. Most "phonic bound" readers function at this level. The syntactic level involves sentence patterns, grammatical markings, transformations, and rewrite rules. There is some disagreement between the generative grammarian camps and those of the generative semanticist. The former feels that it is the grammar that is all important to communication while the latter believes that meaning is central. Whatever the case, the syntactical level represents a mediating position between surface and deep forms of language. The final level, the semantic, represents the successful decoding of a message for meaning. A psycholinguistic model appears in Figure 2.

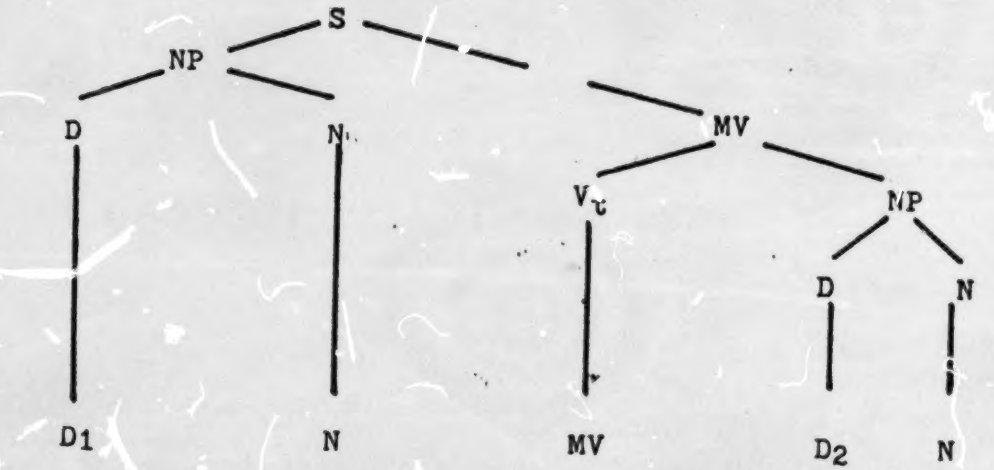
Insert Figure 2 about here

By contrast, in Figure 3 we see a basic information processing model. Here it is hypothesized that in the presence of a graphic stimulus, an image is formed and held in a structure known as the sensory store or register. In the register the icon will persist for approximately one



DEEP STRUCTURE

Human male adult progenitor actor in past caused spherical object to move from self.



SURFACE STRUCTURE

Figure 2. Basic Psycholinguistic Model.

second, holding approximately 25 bits of information. Images in the sensory store are quickly replaced by information from the next fixation point. This process is known as making. Retrieval of sensorily-stored perceptions may involved making regressions. From the sensory store, the input is transferred to the next major component of the system, the short term memory. At this juncture, 7 $\pm$ 2 bits of information are thought to endure for nearly 12 seconds although some estimates go as high as 20 seconds. Regardless, this data base represents what is at the forefront of your mind; what you are attending to and operating upon. This is where the individual lodges the traces of what is read while going on to make sense of the incoming input. This primary or working memory is amenable to rehearsal of the input. Maintaining the data in this buffer enhances the likelihood that the concept can register in the long term memory. This is the procedure one follows in trying to commit a telephone number to memory long enough that the sequence can be recalled for the purposes of dialing. Retrieval is generally easy unless the information is not acted upon within the designated time limitations. This failure precludes the possibility of subsequent retention (Gibson and Levin, 1978).

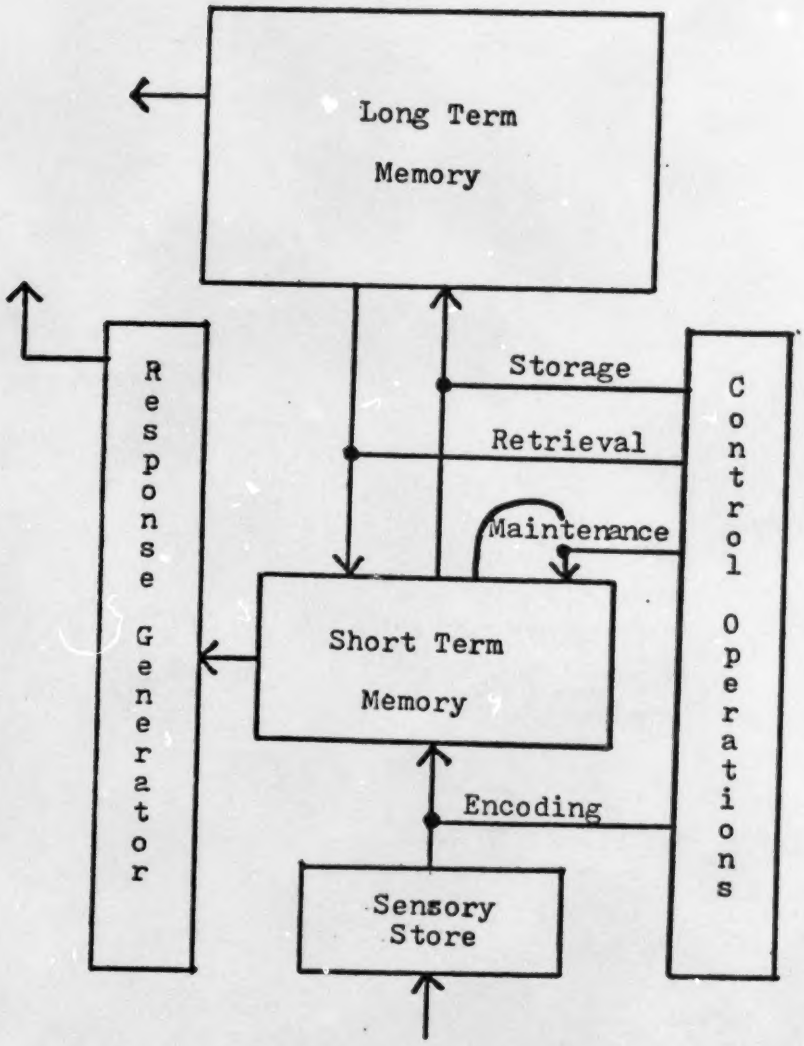
The final step is the integration of the perceptual information with existing structures held in long term memory. It is generally believed that it takes a minimum of 5 seconds to input the LTM. There is no guarantee that once situated there that the concepts can be accessed. This depends largely on the mode of encoding (novelty, vividness, and

recency) and the nature of the retrieval cue. An entry mode or retrieval cue of high magnitude is likely to augment the probability of recall. The capacity of the long term memory is theoretically infinite. Many psychologists feel that once information has gotten in the LTM it is never lost. It is the inadequacy of the retrieval cue or entry mode that prevents the memory from reaching an activation threshold capable of eliciting conscious awareness. The length of time that data can be stored is unknown although it is frequently the case when memories believed to be long lost unexpectedly come to the surface (Hebb, 1958).

Insert Figure 3 about here

Generally, neither the psycholinguistic nor the information processing models are capable of fully describing the reading process. There are noticeable gaps in each. Both are well-developed in the areas they emphasize but fall short or ignore the strength of the other. In the psycholinguistic model, syntactic and semantic components are comprehensively defined, while in the information processing model, featural assumptions are stressed. A large quantity of explanatory power is unearthed when one attempts to synthesize these orientations.

In Figure 4, reading growth is shown as occurring along two dimensions, time (practice) and efficiency. Both the beginning and corrective reader rely almost exclusively on visual information. Their attention is



	INPUT	CAPACITY	PERSISTENCE	RETRIEVAL
STORE	easy, fast	25 bits	brief, 1 sec.	depends on processing
STM	easy	7 ± 2	brief, depends on rehearsal	easy
LTM	5 seconds	theoretically infinite	indefinite	difficult (cues / entry)

Figure 3. An Information Processing System and Corresponding Structure Attributes and Limitations.

dominated by the graphic symbols. In psycholinguistic terms, they are stuck at the surface level. They are unable to avail themselves of highly useful syntactic and semantic cues. Consequently the reading is slow, laborious and generally inefficient. Mature readers, on the other hand, capitalize upon the redundancy which exists between the graphophonic, syntactic, and semantic levels of a message. They select the most economical and productive cues from both visual and non-visual information. Nearly 75 percent of the cues used by proficient readers are of the non-visual variety (Smith, 1978). Their attention shifts automatically and naturally between the various levels.

Insert Figure 4 about here

Whether one subscribes to the psycholinguistic or information processing theories, there is one large given; there exists a large number of efficient readers. The question of whether or not they started at the top (knowledge of language) and worked downward (features) may be largely irrelevant. The significance lies in the virtual effortlessness they exercise while reading. They are processing language information at an automatic level and their attention is predominantly directed at the structual implications of the message. It is the contention of the author that the NIM enables the learner to acquire more productive attention strategies which, in turn, promote automaticity. This resolve between the psycholinguistic and information processing schools of thought is graphically portrayed in Figure 5.

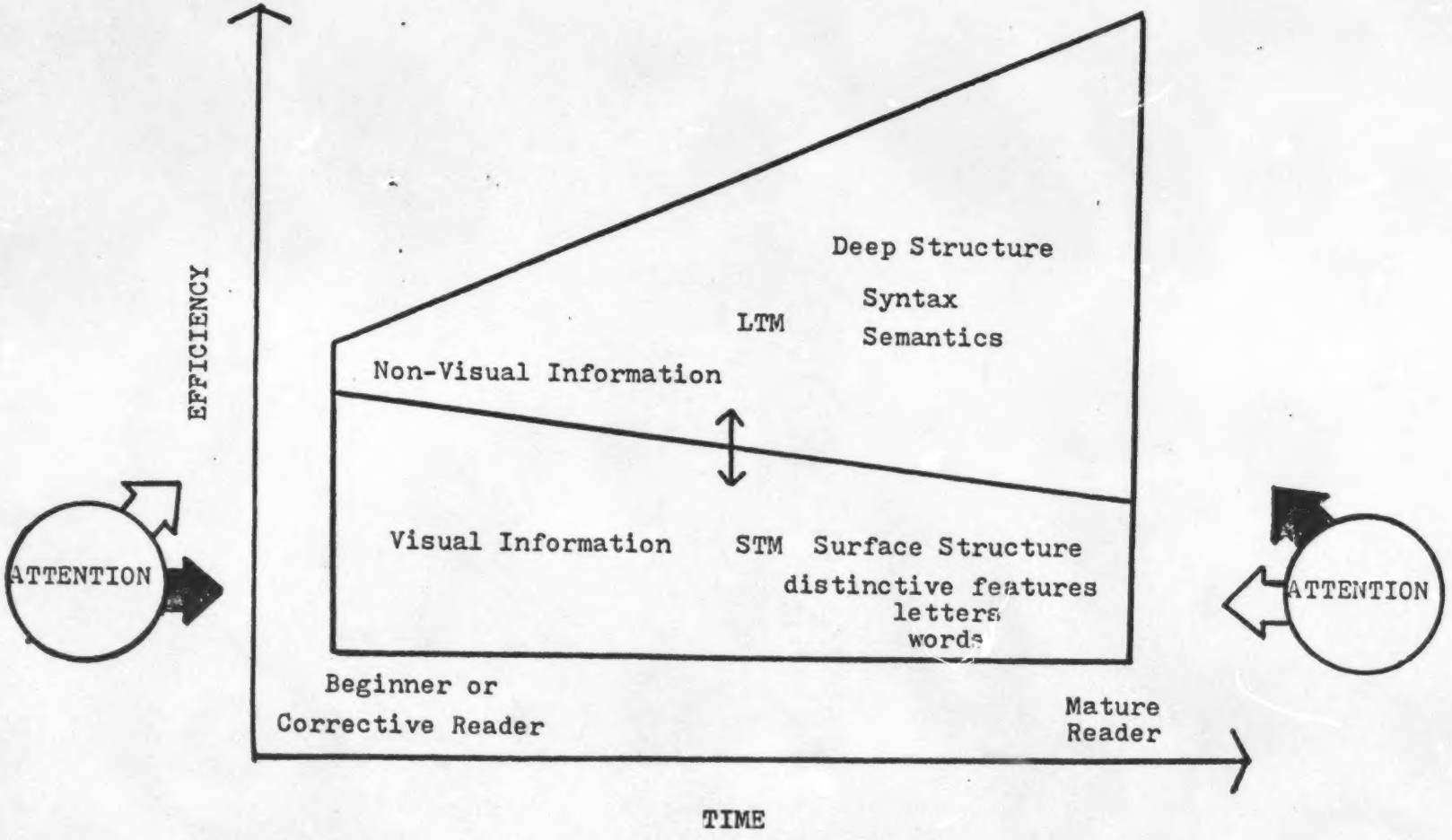


Figure 4. Change in Reliance on Visual Information as a Function of Reading Maturity.

In a psycholinguistic sense, it may be said that the NIM familiarizes the child with the function of reading with features as a by-product. On the other hand, the NIM can be seen as nurturing a sophisticated information processing system. The demands made upon short term memory become reasonable and long term memory retrieval is facilitated by practice. In both instances a complex network of neural pathways is developed which leads to automatic processing for meaning.

Insert Figure 5 about here

Both the beginning and corrective reader are prime candidates for overloading working memory. More often than not, they tend to rivet their attention strictly at the surface level. In approaching each word as a separate entity, the child experiences what Smith (1978) calls "Tunnel Vision." Attention is so rooted in the recoding process that comprehension is reduced to a secondary role. By the time the child manages to complete the reading of a sentence, the information has disappeared from short term memory before he can act upon it. This tendency would also prevent the individual from integrating information across sentence boundaries.

The NIM may extricate the learner's attention from the surface level so that deeper levels of understanding can prevail. The short term memory can then help synthesize orthographic, lexical, syntactic, and

PSYCHOLINGUISTIC MODEL

INFORMATION PROCESSING MODEL

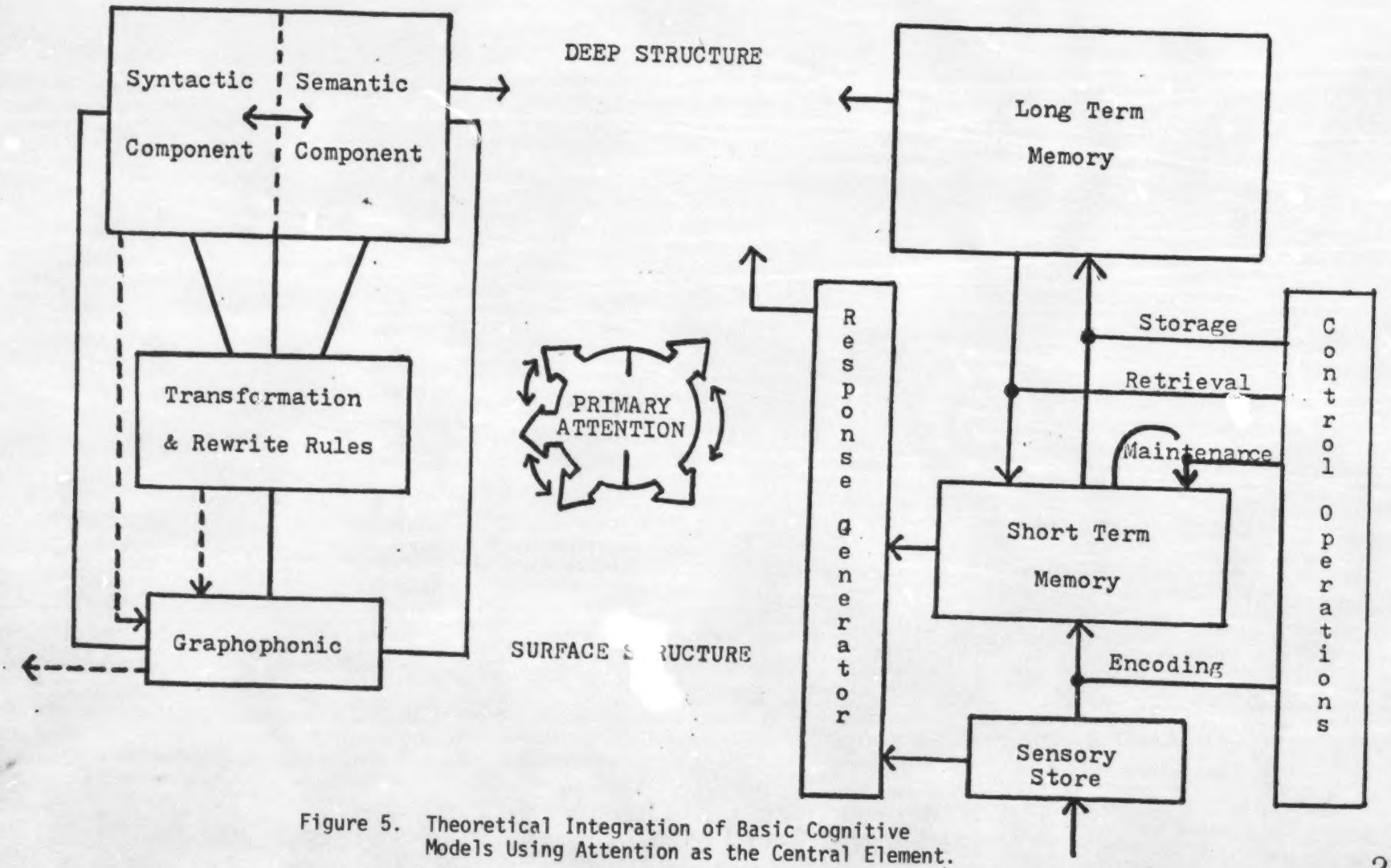


Figure 5. Theoretical Integration of Basic Cognitive Models Using Attention as the Central Element.

semantic information stored in the long term memory structures. Rumelhart (1976) has proposed a computer theory based on interactive stages which, if valid, would help explain the effectiveness of the NIM. The model's most unique quality is that it allows for both top-down and bottom-up processing. It predicts that information is integrated at the pattern synthesizer. The reader can assume features and proceed with meaning first and then move to verification of distinctive feature and letter and word codes. In addition, the reader can progress serially through the system by beginning with visual information and later extracting meaning. Just and Carpenter (1980) have used gaze durations to confirm the ability of the human system to accommodate both top-down and bottom-up processing. It is assumed that the Neurological Impress Method intervenes at the pattern synthesizer. Processing efficiency is facilitated by "training" this synthesizer to direct attention automatically to the most important parts of a message. Through active and repeated exposures to the efficient reading behaviors of a model, the student can infer how to approach graphic language in a more systematic manner.

Insert Figure 6 about here

It is hoped that through the preceding discussion the reader's understanding of the NIM has been enhanced. The technique appears to have considerable instructional utility. Of course, the NIM is not a

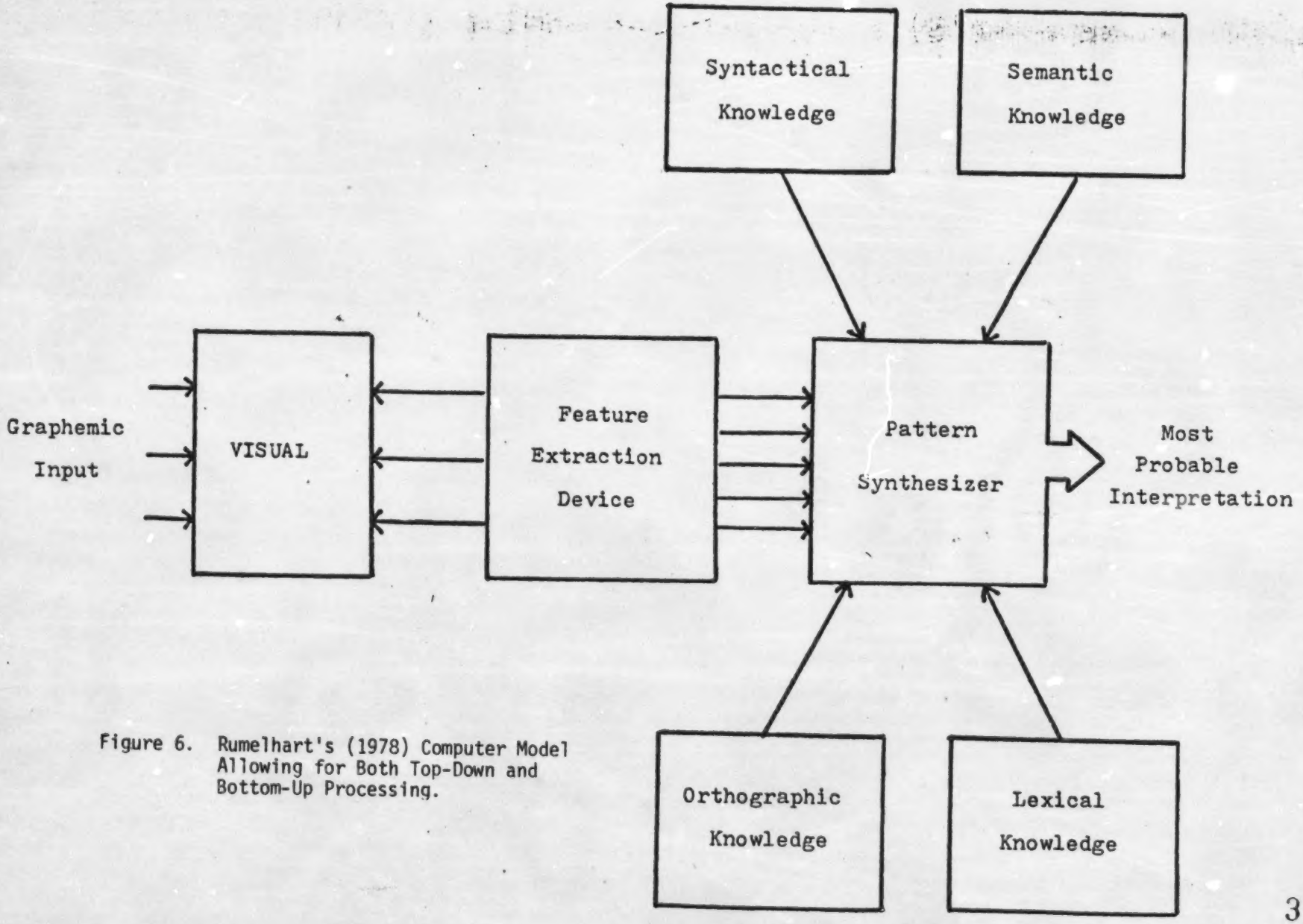


Figure 6. Rumelhart's (1978) Computer Model Allowing for Both Top-Down and Bottom-Up Processing.

total program nor is it appropriate for every child. The method must be wisely integrated with other viable reading techniques. Still, by virtue of its rather unique approach to reading development, the Neurological Impress Method holds great promise as both a preventive and corrective intervention.

References

Arnold, R.D. A comparison of the neurological impress method, the language experience approach, and classroom teaching for children with learning disabilities. Final Report. Washington, D.C.: National Center for Educational Research and Development, 1972. ED 073 428

Arnold, R.D. Neurological impress--Good news or bad? Paper presented at the annual meeting of the International Reading Association. Indianapolis: September 29, 1977. ED 151 721

Bandura, A. In L. Krasner & L. P. Ullmann (eds.), Research in Behavior Modification. New York: Holt, Rinehart, & Winston, 1965.

Beery, J.W. Matching of auditory and visual stimuli by average and retarded readers. Child Development, 38, 1967, 827-833.

Birch, H.G. & Belmont, L. Auditory-visual integration in normal and retarded readers. American Journal of Orthopsychiatry, 34, 1964, 852-861.

Birch, H.G. & Belmont, L. Auditory-visual integration, intelligence, and reading ability in school children. Perceptual and Motor Skills, 20, 1965, 295-305.

Bringman, P. Parent and peer tutoring in reading using the neurological impress method. Unpublished Master's thesis, Indiana State University, 1979.

Cherry, C. & Sayers, B. Experiments upon total inhibition of stammering by external control and some clinical results. Journal of Psychosomatic Research, 1, 1956, 233-246.

Chomsky, C. When you still can't read in third grade: After decoding what? From What research has to say about reading instruction. In S. J. Samuel's (ed.), Newark, Delaware: International Reading Association, 1978.

Cook, J.E., Nolan, G. & Zanotti, R. Treating auditory perception problems: The NIM helps. Academic Therapy. 15, 4, 1980.

Cooper, C.R. & Petroskey, A.R. A psycholinguistic view of the fluent reading process. Journal of Reading, 20, 1976, 184-207.

Cunningham, J.W. An automatic pilot for decoding. Reading Teacher, Jan., 1979, 420-424.

Farnham-Diggory, S. & Gregg, L.W. Short term memory function in young readers. Journal of Experimental Child Psychology, 19, 1975, 279-298.

Forester, A.D. What teachers can learn from "natural readers." Reading Teacher, 31, 2, 1977.

Gardner, C.E. Experimental use of the impress method of reading habilitation. Sacramento, California: California State Department of Education, 1966. ED 003 838.

Gawarkiewicz, P. An impress method of reading instruction. Unpublished Master's Thesis. New Jersey: Rutgers University, 1972. ED 064 699.

Gibbs, V. & Proctor, S. Reading together: An experiment with the neurological impress method. Contemporary Education, 48, 1977, 156-157.

Gibson, E.J. & Levin, H. The Psychology of Reading. Cambridge, Massachusetts: MIT Press, 1978.

Goodman, K. Reading: A psycholinguistic guessing game. Paper presented at the American Education Research Association, New York, February, 1967.

Hartman, F.R. Recognition learning under multiple channel presentation and testing conditions. AV Communication Review, 9, 1961, 24-43.

Hebb, D.O. Diffuse conduction: The basis of higher behavior. In A Testbook of Psychology. Philadelphia: W.B. Saunders, 1958.

Heckelman, R.G. A neurological impress method of remedial reading instruction. Academic Therapy, 4, 1969, 277-282.

Heckelman, R. G. The phonics bound child. Academic Therapy Quarterly 1, Summer 1966a, 12-13.

Heckelman, R.G. Using the neurological impress remedial reading technique. Academic Therapy Quarterly 1, Summer 1966b, 235-239, 250.

Hite, Sr. R. Reading via tape for the inhibited reader, Academic Therapy Quarterly 2, 1966, 23-27, 63.

Huey, E.B. The Psychology and Pedagogy of Reading. Cambridge, Massachusetts: MIT Press, 1968.

Hollingsworth, P.M. An experiment with the impress method of teaching reading. Reading Teacher, 24, 1970, 112-114.

Hollingsworth, P.M. An experimental approach to the impress method of teaching reading. Reading Teacher, 31, 1978, 624-626.

Jones, J.P. Intersensory Transfer, Perceptual Shifting, Model Preference, and Reading. Newark, Delaware: International Reading Association, 1972.

Jordan, W.C. Prime-O-Tec: The new reading method. Academic Therapy, 2, 1967, 248-250.

Just, M.A. & Carpenter, P.A. A theory of reading: From eye fixations to comprehension. Psychological Review, 87, 4, 1980.

Kahn, D. & Birch, H.G. Development of auditory-visual integration and reading achievement. Perceptual and Motor Skills, 27, 1968, 459-468.

Langford, K., Slade, K. & Barnett, A. An examination of impress techniques in remedial reading. Academic Therapy, 9, 1974, 309-319.

Lassen, N.A., Ingvar, D.H. & Skinhøj, E. Brain Function and Blood Flow. Scientific American, 239, 4, 1978, 62-71.

Lorenz, L. & Vockell, E. Using the neurological impress method with learning disabled readers. Journal of Learning Disabilities, 12, 6, 1979, 420-422.

Mathewson, G.C. The function of attitude in the reading process. In H. Singer & R.B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd ed., Newark, Delaware: International Reading Association, 1976, 655-677.

Miller, M.Z. The notebook: remediation by neurological impress. Academic Therapy, 4, 1969, 313-314.

Moffett, J.A. A Student-Centered Language Arts Curriculum. Boston, Massachusetts: Houghton-Mifflin, 1973, 202.

Muehl, S. & Kremenak, S. Ability to match information within and between auditory and visual sense modalities and subsequent reading achievement. Journal of Educational Psychology, 57, August 1966, 230-239.

Perfetti, C.A. Language comprehension and fast decoding: Some psycholinguistic prerequisites for skilled reading comprehension. In J.T. Guthrie (ed.), Cognition, Curriculum, and Comprehension, Newark, Delaware: International Reading Association, 1977, 20-41.

Rumelhart, D.E. Toward an interactive model of reading. In D. Lapp & J. Flood, Teaching Reading to Every Child. New York: MacMillan, 1978.

Smith, F. (ed.) Psycholinguistics and Reading. New York: Holt, Rinehart, and Winston, 1973.

Smith, F. Understanding Reading: A Psycholinguistic Analysis of Reading and Learning to Read, 2nd ed., New York: Holt, Rinehart and Winston, 1978.

Spache, G.D. Investigating the Issues of Reading Disabilities. Boston, Massachusetts: Allyn and Bacon, 1976.

Sterritt, G.M. & Rudnick, M. Auditory and visual rhythm perception in relation to reading ability in fourth-grade boys. Perceptual and Motor Skills, 22, 1966, 859-864.